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Implementing Simulation in ICU New Graduate Nursing Orientation: Introducing Two Practice Innovations

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Table of Contents

Abstract

A change project involving the use of innovative wearable simulation technology was integrated into the 12-week new graduate nurse ICU training program at one community hospital in Northern California. Project implementation was interrupted by the Covid-19 pandemic, so only the first pilot training session was conducted. Initial results from this training session suggest that the simulation training had a positive impact on the nurses' ability to assess patient breath sounds and to recognize and treat a rapidly deteriorating patient. This training session also allowed the project team to identify additional areas of skill assessment and opportunities for improvement for the novice nurses—for example, the awareness of and ability to use a specialized procedure cart to treat deteriorating patients. These results will be utilized to design additional training sessions and further address gaps in knowledge, skills, and confidence. Future training sessions will occur once pandemic conditions allow change project implementation at Community Hospital to resume.

Keywords: simulation training, new graduate nurse, training, wearable simulation technology, patient assessment, ICU

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Introduction

Although new graduates enter the workforce with basic nursing skills and knowledge, they often lack adequate training to equip them to deal with many of the demands of a nursing career. Research suggests that a structured teaching program has appealing effects, including increasing nurse retention rates by as much as 30% and helping new hires gain important skills, retain knowledge, and increase confidence levels (Everett-Thomas et al., 2015). Kim et al. (2018) note that a structured new graduate teaching program has been demonstrated to increase confidence, skills, and competency in new graduate nurses. However, there are so many different styles of training—lectures, self-paced computer modules, assigned reading, "see, do, teach," and mentor pairing, to name just a few—that it can be difficult for a hospital to decide which training method will be most effective. Somewhat recently, however, simulation training has been increasing in popularity as a teaching/learning method.

Simulation training allows healthcare providers to develop specific skills within "safe learning environments" that imitate "reality safely and efficiently" (Uslu et al., 2019, p. 1627). Such training has become more widely accepted in clinical settings in recent years due largely to the fact that in other high risk industries such as aviation, simulation training has shown positive safety outcomes in terms of participants' ability to respond to simulated scenarios. Rather than using the "see one, do one, teach one" method that, according to the Agency for Healthcare Research and Quality (AHRQ, 2019, par. 1) is the most common methodology of training new nurses on the floor, studies have shown that simulation training reduces errors and provides more opportunity for trainees to act in a "safe" environment in which trainer and trainee can evaluate

the skills and interventions performed with real-time feedback. According to the AHRQ (2019), there are multiple levels of simulation-based training, including part-task trainers (i.e. artificial limbs or parts), full-scale simulators (i.e. full body mannequins), virtual reality (VR) technology to create highly specialized simulation environments, in-situ simulation (on-site simulation with a preceptor), and standardized patients (real human actors playing the patient roles).

Information Technology (IT) is also an important tool for expanding research, information storage, and information sharing, and it has recently increased in value as a tool for helping healthcare personnel incorporate evidence-based practice (EBP) into their care of patients (Dewsbury, 2019). There is a paradigm shift occurring in nursing care and education (Jeong & Lee, 2019), and simulation is now widely accepted as offering high educational value to the nursing profession. This paper will discuss a quality improvement (QI) project undertaken using simulation training as a way to improve new graduate nurses' skill and confidence levels. It is important to clarify that, while the initial stages of this QI project have been completed, full implementation of the project was interrupted by the Covid-19 pandemic; therefore, this paper will discuss stages of the project which have already been completed as well as stages which have been planned for but not yet implemented. It is the hope of the QI project team that implementation will continue once hospital conditions allow re-initiation.

Problem Description

Current Knowledge About the Problem

For reasons of anonymity relating to the current Covid-19 pandemic, a Northern California hospital where the author works has declined to be identified in this paper; this facility will therefore be referred to as "Community Hospital," and no obviously identifying features will be mentioned. The ICU at Community Hospital is a 24-bed unit which provides acute care, and

an educator at another facility within the same hospital system has noted that approximately 75% of the nurses in the ICU units are novice nurses: "Many of them are trying to not only get a grip of the basic skill set of nursing, but in addition have a burden of knowing the more critical care side to situations, which makes it hard to teach. Also, there are a lot of new graduate nurses who are often confused when an emergency situation arises which calls for a procedure cart" (Anonymous educator, personal communication, January 26, 2020). According to this educator, there is a large gap between novice and veteran nurses on the floor, and it is difficult to track whether failures in EBP care are due to lack of actual knowledge, lack of experience, or both. This is a significant problem at Community Hospital, with the current new graduate cohort expressing a unanimous desire for exposure to training and proper tools that will develop their skills and experience in identifying and treating rapidly deteriorating patients. Boling and Hardin-Pierce (2016) echo the importance of nurse experience in critical care, noting that critical care patient outcomes are linked to provider experience. They also note that it can be challenging to maintain the requisite high level of experience among ICU staff as experienced nurses retire and are replaced with novice nurses (p. 287).

In reviewing the literature on novice nurses, Manoochehri et al. (2015) note that studies have shown that younger, more inexperienced nurses (those between ages 21 and 35) have the highest work dissatisfaction levels among nurses because "they do not have the necessary experience, and they are not competent enough to meet the patients' needs and provide care with high quality" (p. 32). And while estimates vary widely on the cost to hospitals of recruiting, onboarding, and training new nurses (from around $10,000 per hire to as much as $88,000), there is a clear consensus that the costs are extremely high (Kurnat-Thoma et al., 2017). One clear way to reduce such costs, therefore, is to reduce turnover by providing better training that equips

nurses adequately for the job and thus increases their levels of job satisfaction. A cost benefit analysis demonstrates that, even with the upfront cost of purchasing simulation suits, each 25% reduction in annual ICU nurse turnover could save the hospital approximately $90,000 over a 2 year period (see Appendix H – Cost Benefit Analysis Table).

The question, then, becomes how to adequately mitigate the lack of actual years of clinical experience among novice ICU nurses in a way that increases their knowledge, practical skills, and confidence. Multiple studies and reviews suggest that simulation-based education can be an important training tool for mitigating lack of clinical experience, increasing nurse confidence, and fostering application of knowledge to clinical settings (Abelsson et al., 2016; Marzouk, 2015; Terzioğlu et al., 2016; Uslu et al., 2019).

Leapfrog grades at Community Hospital indicate that only about 64 out of 100 nurses have "qualified" characteristics in the category of *Prevention of Harm [to patients*], and only 62% of patients would recommend Community Hospital to a friend or family member (The LeapFrog Group, 2019). This data supports the potentiality that there is a gap in nurse knowledge and/or experience at Community Hospital, and that this gap is obstructing the delivery of high-quality patient care.

Setting

The 24-bed ICU at Community Hospital is the setting for a quality improvement project designed to enhance new graduate (novice) nurse learning. The project involves the use of four wearable 'sims,' high-fidelity wearable simulation devices worn by actors or experienced nurses and used in training scenarios designed to increase novice nurses' confidence and skill levels. These sims allow the nurse educator to control features such as breath sounds, heart sounds, blood return, airway compliance, central line accessibility, and urinary symptoms. Additionally,

future implementation stages of the project will include utilization of a previously existing specialized procedure cart (i.e. respiratory cart) on the unit; this cart will be revamped with a kiosk system which would use IT to allow nurses to access an app that links to the latest EBP policy and protocol for the procedure. Though there are multiple procedure carts on the unit, this project and pilot study focuses on the respiratory cart as a tool. Incorporating a standardized (organized) procedure cart with a kiosk for the new graduate nurses could potentially decrease confusion when nurses are obtaining tools for an emergency situation (such as a rapidly deteriorating patient). An advanced simulation method combined with easy access to an appropriate specialized procedure cart can be used to help increase the floor nurses' knowledge of the most common skills needed to recognize the signs and symptoms of a rapidly deteriorating patient and work safely on the 24-bed ICU. In addition, wearable simulation devices would also increase interpersonal skills by simulating a more realistic relationship between nurse and "patient," rather than using a mannequin that does not talk back. As Abelsson et al. (2016) have noted, the ability to interact with patients is a key feature of successful simulation training.

One of the missions of Community Hospital is to put patients first and to be authentic, present, and accountable. Community Hospital stands behind improvement and learning and is open to implementing quality improvement measures. Other QI measures which have been implemented at Community Hospital and which are currently being evaluated by daily audits on nurse charting include measures related to lines, airways, drains, skin checks, sepsis recognition and action, and verifying infusions hourly. Moreover, there has been a rapid growth in adapting a sister hospital's goal of training nurses in the most up-to-date evidence-based policies and procedures as noted in daily huddles. Given this climate of desire for growth coupled with the

current issues in the Community Hospital ICU, it is this author's assessment that Community Hospital is ready for a change and improvement in its novice nurse training program.

Metrics that Matter

The impact on patient and organizational outcomes is anticipated to be positive. The goal of using wearable "sims" and standardizing specialized procedure carts is twofold: 1) to decrease nursing errors such as failure to recognize early signs of patient deterioration and care delays due to supply disorganization, and 2) to increase nurse-patient communication; for example, by allowing nurses to practice patient communication skills during tense, complex clinical scenarios. These interventions could also result in higher patient satisfaction. According to Hospital Care Data (2020), Community Hospital has a rating of 3 out of 5 stars on the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores for patient satisfaction with their hospital stay. The HCAHPS survey is administered to patients 2 to 42 days after hospital discharge and reflects patient responses to a series of questions about their hospital experience, and a rating of just 3 out of 5 stars indicates a clear quality gap. HCAHPS scores for Community Hospital also indicate that there is room for improvement in nurse-patient communication regarding medication administration, plan of care, and discharge instructions.

Initial meetings with the Community Hospital ICU nurse educator and the wearable simulation technology team confirm that implementation of the QI project will cost approximately $5,000-$7,000 per piece of equipment. However, there is a consensus among Community Hospital's education team that in the long-term, the simulation technology ? devices will be valuable training tools for new graduate nurses in multiple areas of care, including communication skills. According to Community Hospital's Nurse Educator, it costs nearly $30,000 to orient and train a new graduate nurse on the basics of nursing care over the course of

twelve weeks. This cost includes base RN pay for the trainee nurses, use of facilities, and other costs that accrue as a part of the standard 12-week training program. Implementation of this change project would cost an additional $25,000 - $35,000 (See Appendix H for a cost benefit analysis of implementing this change project). There are 5 pieces of wearable simulation equipment (the chest piece, tracheostomy piece, central line piece, foley catheter insertion piece, and arm piece), and each costs $5,000 - $7,000, resulting in an added cost of $25,000 - $35,000. However, it is important to recognize that this represents a one-time, upfront cost; this cost is accrued only once, and then the wearable simulation pieces can be used for future training programs/sessions as well. Community Hospital's educator notes that one of the fundamental areas where new graduate nurses need to gain confidence and skills is nurse-patient communication, and the wearable simulation costumes will aid with nurse training in this area. Research by Terzioğlu et al. (2016) concluded that instructional environments that are as close to reality as possible and which include simulator devices have positive outcomes in increasing confidence and competence levels in new graduate nurses (p. 107). According to their study, among the 58 students who were given an opportunity to practice communication skills in simulation across various settings, more realistic settings were associated with greater student scores in terms of communication with the patient, with 35% of the students stating that they were "able to use their communication skills" in a nursing skills laboratory versus 40% in a clinical practice environment (p. 107).

Available Knowledge

PICOT question

A PICOT formatted question (P-population/problem, I-intervention, C-comparison/control, O-outcome, and T-time) was used to evaluate evidence-based data and to

guide the literature search and implementation for this change project. The formulated PICOT question was: For a local community hospital ICU (P), how does the use of an organized new graduate training program using wearable simulation devices and IT-driven specialized procedure carts (I), compared to the current new graduate training practices (C) impact knowledge, recognition, and treatment of rapidly deteriorating patients (O) during a 12 week period post training (T)?

Literature Search

An electronic literature search was done using databases including: PubMed, ProQuest, CINAHL, and Ovid. Search terms included variations of the following: "simulation training," "simulator mannequin," "education simulation," "new graduate nurse simulation," "new graduate training," "new graduate simulation training," "efficacy of simulation training," "training new graduate nurses," "nurse training," "barriers to nurse training," "new graduate nurse satisfaction in training," and "standardized crash carts." Search limits were set to include only peer-reviewed studies from January 2015 to the present (July 2020). Each search yielded approximately 5 to 10 results, some of which contained links and referenced articles that were also relevant to this change project but which had not appeared in the original searches. Of the nine studies that met standards for this research project, five were chosen for inclusion in an annotated bibliography (please see appendix A). To evaluate the level of research for each of these articles, the John Hopkins Nursing Evidence-Based Protocol (2017) was used, which classifies studies as Level I (including randomized controlled trial studies and others of similar caliber), Level II studies (which includes quasi-experimental and similar studies), and Level III studies (which include qualitative, nonexperimental, and similar studies). Evidence is then further categorized as A, B, or C (high, good, or low quality, respectively).

Literature Synthesis

According to an article by Everett-Thomas et al. (2015), The National League for Nursing holds that upon graduation, nurses should be prepared to meet the needs of the workforce (p. 34). In this study, twenty groups of new graduate nurses were observed using a check-off list of skills and recognition of a deteriorating patient, and simulation training yielded positive outcomes in terms of providing the novice nurses a safe environment to practice the skills they had learned in the classroom and incorporate them into bedside actions for the end goal of patient safety.

In a descriptive study of 54 senior nursing students, feedback from students on the use of simulation on triage cases indicated that 62.5% felt more confident in their nursing skills to assess, identify, and perform accordingly (Uslu et al., 2019). Similarly, a prospective study of 59 new graduate nurses determined that students felt less anxious in clinical practice when they had had more practice using simulation; initially, the mean "trait anxiety score" was 41/100, but this score decreased to 31-33/100 as nurses had more practice and exposure via simulation (Terzioğlu et al., 2016).

In another study, a randomized control trial of 92 female students out of 196 assigned to a maternity course were split into two groups and were observed for evaluation of the students' practical achievements (skillset) and satisfaction levels. Results showed that students who were given the opportunity to be part of simulation training had better outcomes than those who did not have a simulation training program: 46.5 vs 36.9 with a CI 95% and $p<.001$ for the skills portion; and 21.1 vs 11.2 for satisfaction scores (Marzouk, 2015, p. 56).

The average cost of replacing or hiring an individual registered nurse varies, but the overall annual nurse turnover can cost a hospital about 7.9 to 8.5 million dollars (Kurnat-Thoma

et al., 2017). A retrospective study was done to implement a “10-element program” to help intervene and strengthen one hospital's retention rates, one of which was done by implementing a new employee onboarding process. The program focused on areas of skills and communication via interdisciplinary hospital teams. The results showed a decrease in new hire turnover rates from 18.2% to 11.9%, which then showed a drastic overall hospital-wide reduction in turnover rates from 39.1% to 18.4%. This is similar to another research study which noted that with a highly innovative training program, there is as much as a 30% reduction in first year turnover rates (Everette-Thomas et al., 2015). This ultimately showed how lateral integration with interdisciplinary teams (from nurses to managers) along with micro, meso, and macrosystem support combined to increase RN retention rates (Kurnat-Thoma et al., 2017, p. 3).

Various institutions that have implemented some sort of simulation practice have shown to be ideal learning environments to help decrease new graduate nursing students’ levels of anxiety while increasing communication skills and overall student satisfaction (Terzioğlu et al., 2016).

Rationale

Change is necessary for progress, yet sustained change is difficult due to numerous internal and external factors. Therefore, it is important for those implementing change, such as a clinical nurse leader (CNL), to understand change theory and to plan accordingly to achieve sustainable results. A relatively new nursing role, the CNL, has emerged to act as a catalyst for change in unit-based microsystems (American Association of Colleges of Nursing, 2013). In this improvement project, the CNL (a graduate CNL nursing student) incorporates both systems thinking and change management models within multiple roles such as clinician and educator.

Mitchell (2013) notes that, while planned change is vital to the evolution of nursing practice, “attempts at change often fail because change agents take an unstructured approach to implementation (p. 32). Therefore, to structure this change project, an appropriate change theory was selected: Kurt Lewin’s classic 1951 Change Theory. Lewin categorized change as happening in three parts: unfreezing (when change is needed), moving (when change is initiated), and equilibrium (when there is balance) (Nursing Theory, n.d.). According to Lewin’s Change Theory, specific driving forces cause change to occur that push the individual to seek a desired outcome. Restraining forces hinder an individual from accomplishing positive change. Unfreezing helps the individual let go of what was ineffective, by creating more driving forces to achieve positive outcomes (Nursing Theory, 2016).

Lewin’s Change Theory is relevant to the implementation of the new graduate nursing program because it provides a framework for identifying driving forces. This was important since leveraging the driving forces was a key factor in convincing the unit manager and hospital stakeholders of the efficacy of implementing new novice nurse training procedures using wearable simulation devices and standardized specialized procedure carts. The target population includes the ICU at Community Hospital. As verbally stated by the current educator, there needs to be change that will continue to attract new graduates, inspiring them to implement evidence-based practices (EBP) and continue learning new skills, thus strengthening the entire hospital system. The education team at Community Hospital will be responsible for the implementation of the new graduate program and introducing wearable simulation devices that correlate to EBP standards of care. In addition, there will need to be ancillary tools including an IT-driven kiosk device (such as an iPad) at the specialized procedure carts in order to decrease new graduate

confusion and anxiety about using the cart as a tool when necessary both in simulated case scenarios and real life cases reflecting patient deterioration.

Project Aims

Global Aim Statement

The global aim is to augment the new graduate ICU nursing training program through integration of new teaching/learning activities that will increase each participant's overall confidence, skill set, and satisfaction levels to effectively identify, assess, and treat a rapidly deteriorating patient in the ICU.

Specific Aim Statement

To test the integration of two new evidence-based components of a new graduate ICU training module during a 12-week new graduate nurse training program by using wearable simulation devices and organized specialized procedure carts that incorporate a kiosk tablet.

Improvement Model

The model for improvement (MFI) as described by the Institute for Healthcare Improvement (IHI) recommends that tests of change are implemented through rapid cycle testing in the microsystem (IHI, n.d.). This involves introducing PDSA (Plan, Do, Study, Act) cycles to actually test the hunches or creative ideas of team members and to assess benefits and barriers. For this evidence-based improvement project, an example of one PDSA cycle includes the following:

Plan: Integrate wearable simulation devices and an organized procedure cart using Information Technology into the current ICU new graduate hiring program. This will be over the course of two weeks where the education team will coordinate with staff on the introduction of the specialized procedure cart (starting with just one initially, such as the respiratory cart).

Do: Create two emergency case scenarios for the new grad hiring program which use the wearable sims along with a specialized procedure cart with a kiosk tablet for the case scenario as warranted. This will be over the course of 4 hours for 2 days of the 12 week new graduate program.

Study: Use Likert surveys pre- and post-scenario to evaluate the impact of the training on new graduate hires' confidence and skill levels (using a check-off list of recognition and action of the simulated deteriorating patient).

Act: Implement wearable simulation devices and specialized procedure carts as an integral part of the new grad training program at Community Hospital. Research and data collected from the pilot study will be presented to the stakeholders of Community Hospital to encourage the use of the new and innovative way of teaching new graduate nurses.

Methods

This change project started at Community Hospital but was unable to proceed due to the constraints of the current pandemic. Although the earliest stages of the project were implemented (including the microsystem assessment, literature review, development of first training session, and implementation of first skill training session), the project was interrupted by the Covid-19 pandemic and the final stages of the project were not implemented. Specifically, the entire project calls for a series of multiple skills training sessions as a part of the 12-week new nurse training program; only the first skills session was conducted. This training session involved only one of the five wearable simulation devices (the chest piece) and did not incorporate use of the specialized procedure cart or kiosk tablet. The project team anticipates conducting the remaining sessions when conditions at Community Hospital allow reinitiation of improvement initiatives.

Context

In order to understand how this QI project has been designed, it is helpful to identify the relevant steps taken during implementation. This section of the paper will discuss both those steps in the implementation process which have already occurred as well as those steps which the author anticipates completing once the QI project resumes.

Microsystem Assessment

One of the initial steps was conducting a microsystem assessment of the Community Hospital ICU. Microsystems are interdependent systems composed of individuals, and the systems themselves, even apart from the individuals who comprise them, can be strong or weak. As Nelson et al. (2007) note, the best way to influence a system or effect change is to work within the system's dynamics, since those dynamics are what form the system's identity. Strengthening a microsystem requires that it become self-aware, particularly of its weaknesses. Being aware of weaknesses is useful in minimizing microsystem inefficacy and can promote sustained improvement; furthermore, because microsystems are the units which provide most health care to most people, strengthening and improving microsystems is a vital part of creating healthcare that is both efficient and patient-centered (Nelson et al., 2007). A 5P microsystem assessment analyzes a microsystem's purpose, patients, professionals, processes, and patterns (Nelson et al., 2007). A 5P microsystem analysis of Community Hospital's ICU was performed by this author to identify a change project to help address a gap analysis in the microsystem as reflected in variable and inconsistent processes and patterns, especially related to new graduate orientation (see Appendix B).

Areas of Strength. The ICU has yearly new graduate training programs to help direct news nurses in the most common procedures performed in the ICU such as extraventricular drainage (EVD) system setup, arterial line setup, and chest tube management. This program

consistently places new graduates with veteran nurses on the floor, which is helpful in establishing a sense of daily direction for the unit. There is also an overall sense of cohesiveness and support amongst team members. Patient and employee complaints are minimal and do not impact the culture of the unit in a significant way.

Areas of Weakness. The areas of strength overlap with this ICU's weaknesses. For example, the new graduates are set up for a 12-week didactic training program, which is a strength; however, the program itself does not provide novice nurses with hands-on experience with deteriorating patients and does not have a check-off list for each of the skill sets that novice nurses should be developing for critical care. The educator for Community Hospital's ICU stated that "there is a program available, but we don't do skills check-offs the same way other hospitals do them. We simply train them with modules and if they have any questions, nurses can bring them up to the preceptor."

Another example relates to veteran nurses, who are an important resource for new graduates. These veteran nurses often lack technology savvy and proficiency and may be unable to readily locate policies and procedures via the hospital's intranet. In the instance s/he does know how to locate the policies and procedures, the policies themselves may not be up to date for the ICU. In addition, many of the specialized procedure carts are stocked according to "custom" rather than by using a standardized checklist system. Essentially, the carts are stocked (and restocked) by veteran nurses who simply "know" what is supposed to be on each cart. The result is that novice nurses have no formalized way of knowing where certain specialized items are kept or where to access them in case of an emergency. For example, when a veteran nurse at Community Hospital was asked how a new graduate nurse was supposed to know what was in the specialized respiratory cart, the veteran nurse responded "We just know from experience.

Usually there is someone on the floor who has used it before and knows what to grab in times it is needed" (Anonymous, January 3, 2020). This is problematic because it can create delays in patient care. Milloy and Bubric (2016) discuss the importance of standardizing specialized carts (such as crash carts), noting that disorganization or inconsistent organization can pose significant patient risks by hindering the ability of providers to locate necessary supplies in a timely manner.

Opportunity for Improvement. Since this norm has prevailed in the ICU, much of the training that the novice nurses receive from the unit's veteran's nurses consists of "this is what I was taught." While passing on learning and knowledge in such a way can be effective in some situations, it lacks consistency, reliability and reproducibility. Clearly, a more formalized, systematic, structured training period—including a more accountable process for stocking and restocking specialized procedure carts—would help mitigate this microsystem weakness. Furthermore, the confidence and competence of new nurses could be reinforced by fostering a culture of learning, improvement, and effective teamwork.

Additional Tools Used to Structure the Change Project

A Gantt Chart (see Appendix D) was created to establish a projected schedule for the microsystem change project in accordance with Lewin's Change Theory. A literature review was conducted to determine the best practices and evidence for developing the change project and interventions.

An educational module was developed to structure the teaching of the new graduate nurses during the 12-week intervention. Everette-Thomas et al. (2015) state that, while new graduates are required to have skills that are strong enough to allow them to enter the nursing workforce, novice nurses still need to be nurtured into floor nurses as they learn to apply their knowledge and skills from school to clinical practice. Therefore, in accordance with research

findings that such a program can help develop the confidence and the skillset of new nurses (Everette-Thomas et al., 2015), implementation of a new graduate simulation program was chosen as an effective QI project. The educational plan was based on the TeamSTEPPS framework (see Appendix C for teaching plan and TeamSTEPPS model pictorial). The TeamSTEPPS framework is currently designated as an effective tool to monitor the steps in a team effort to improve conditions for patient safety in a given microsystem (AHRQ, 2013). There is evidence to support the idea that safe and effective nursing care can be optimized using the four teachable-learnable skills of the TeamSTEPPS module: communication, leadership, situation monitoring, and mutual support (AHRQ, 2013). Building upon these adaptable aspects of the TeamSTEPPs module gives direction for educators at Community Hospital to help adapt the framework to fit specific teaching goals or topics, such as the wearable simulation devices. Kim et al. (2018) stress how important a structured didactic new graduate nursing program is for increasing the long-term confidence, skills, and competency of new grads. Additionally, a structured didactic program can have other appealing effects such as increased retention rates, higher levels of retained knowledge, and increased nurse confidence (Everette-Thomas et al., 2015).

Finally, a project team was formed to help guide implementation of the change initiative. The project team consisted of the author (a CNL graduate student who works at Community Hospital), the Nurse Educator, and two staff developers (whose roles are similar to nurse managers).

Intervention

Ideally, a teaching plan for implementing new nurse training in the ICU would involve many components and pre/post assessments. Introduction to wearable devices and use of

standardized specialized procedure carts were planned but not fully operationalized due to the pandemic priorities.

The simulation suits have several components. These include a chest piece, a tracheostomy piece, a central line piece, a foley catheter insertion piece, and an arm piece with peripherally-inserted central catheter (PICC) and peripheral intravenous catheter (PIC) components. The initial plan was for the novice nurse training program to involve both the simulation suits and the standardized procedure cart as part of the training in learning to identify and respond to scenarios with rapidly deteriorating patients. However, the project team decided that the initial pilot simulation training would involve only the chest piece and, due to time constraints, would not involve the specialized, standardized procedure carts. In early February 2020 (see Appendix C), end users and educators were trained by the simulation company on how to use the wearable simulation chest piece device. The project team then developed two case scenarios for use in the nurse pilot training: autonomic dysreflexia and pulmonary embolism. The pilot training session took place in late February 2020 and involved six new graduate nurses. This was a 1.5 hour training session conducted by this author, the Nurse Educator, and the two staff developers (see Appendix C for full teaching plan). The session started with a survey (see Appendix F) assessing nurse confidence levels in their ability to identify and treat a rapidly deteriorating patient, perceptions of technology, and knowledge about specialized procedure carts. The trainees took turns using the pre-developed scenarios to practice, and the session involved debrief time at the end during which learners could process their experiences, offer feedback, and discuss application of the knowledge they gained to the real-world clinical setting. Because of restrictions caused by the Covid-19 pandemic beginning in early March 2020, this is the only pilot study (to date) that has been conducted, and it involved only the chest piece from

the simulation suits and did not involve a standardized procedure cart with a kiosk. Originally, the pilot study was intended to encompass all 5 pieces of the simulation suit as well as the standardized procedure cart; however, the project team decided that, due to time constraints, the first pilot training session would use only the chest piece and would not involve training with the standardized procedure cart. The plan is to integrate these additional training tools into future skill training sessions during the 12-week new hire training program (which will occur once QI project implementation resumes after the Covid-19 pandemic).

Training Plan

If the full training plan were to occur as developed and planned, there would be a series of multiple hands-on training "skills" day sessions conducted over the course of Community Hospital's 12-week new graduate hire training program. Each session would begin with a pre-simulation survey using a likert scale and would end with a post-training survey (Appendix F). Both surveys will ask the same questions so that participants' responses can be evaluated for levels of knowledge and confidence. Simulation scenario practice sessions will be recorded and used during a debriefing session held at the end of each training day.

Implementation of the first (and, to-date, the only) pilot study consisted of an educator wearing the simulation chest piece device, the author acting as the off-going shift nurse, one of the six students acting as the incoming nurse, one acting as the charge nurse, and one acting as the resource nurse while the remaining three students acted as bystanders observing the scenario. After running through the first case scenario, student roles were switched, and the second case scenario was implemented so that each member of the cohort had the opportunity to act as observers/bystanders and as participants. The purpose of the split group was to allow all students to participate in the simulation (whether it be as the primary nurse or the resource

nurses). These two case scenarios were recorded so that they could be used in the debriefing session which occurred at the end of the training session.

Studying the Intervention

The pilot study for introducing the wearable simulation devices in two case scenarios showed positive outcomes (see Appendix G for a breakdown of pre- and post-survey data). The debriefing was a success. In the debrief session which followed the simulation training, educators engaged in a play-by-play analysis with the new graduate nurses in which both educators and nurses offered verbal feedback which was documented. In addition, new grads were able to offer constructive criticism on their own performance and that of their cohort. Verbal responses from the trainee nurses included discussion about being nervous and uncertain about their assessment skills. New grads were also able to recognize that they were all very quick to call for help and had "tunnel-vision," elaborating that they are all very task-oriented and unfamiliar with how to cope with the multiple stressors presented in the case study scenarios. Overall, verbal feedback of the case studies showed positive perceptions of the training, and there was a consensus that it was helpful to engage a “patient” with a wearable simulation device, rather than working on a stationary mannequin that would otherwise be unable to give real-time responses and feedback.

Post-simulation surveys were administered with the same questions as the pre-simulation survey (see Appendix F). The general response from the group of new graduate nurses was that the wearable simulation device combined with the verbal debriefing showed them areas of weaknesses that could be improved. For example, in response to the statement “I am accountable for my actions and know the skills necessary for working as a licensed registered nurse” with 1=strongly disagree and 5=strongly agree, the mean pre-intervention score was 4.33 while the

mean post-intervention score was 3.5. The project team speculated that this decrease indicated that the simulation intervention made the novice nurses more aware of their dependence on veteran nurses, thus helping them recognize that they are not yet entirely capable of being accountable for their own actions as nurses. There was also an increase in nurse confidence regarding their assessment skills. In response to the statement "I feel confident with my assessment skills in identifying deteriorating patients" the mean pre-intervention score was 3.67, while the post-intervention mean score was 4.0. Confidence in assessing breath sounds increased from 3.17 to 3.5. Overall, the post-training Likert scale responses showed improved confidence and less anxiety about recognizing rapidly deteriorating patients.

This was only the first pilot study, so feedback will be used to continue refining the training/learning processes. The new graduates will continue to have hands-on and preceptor training on the floor alongside their lectures and the simulation training in the education department, which will continue for twelve weeks with the same new graduate hire group. Moreover, future simulation training courses (within a single 12-week training program) will be tailored to address specific gaps in new hire knowledge while giving them additional tools to assist in meeting the needs of rapidly deteriorating patients. Depending on skills in which students demonstrate a lack of proficiency while working with their preceptors on the unit, future case scenarios will be tailored to address those customized skill or practice gaps. The goal is to help mitigate gaps in knowledge and proficiency in newly hired nurses by the end of their didactic training. For example, one such tool incorporated into future training courses will be the specialized procedure cart. During the pilot session, it was clear that there was a knowledge gap around how to use the available crash cart; therefore, future sessions will incorporate relevant training in this area. The project team will work with the educators to set up the subsequent

training meetings using the wearable simulation devices pending the results of feedback from the veteran nurses precepting the students on the floor.

Measures

This section will discuss the tools used to study and measure the processes and outcomes of the change intervention project. Short-term, intermediate, and long term goals were employed.

SMART (**s**pecific, **m**easurable, **a**chievable, **r**ealistic, **t**imely) goals were first developed by Doran (1981) to guide the formulation of management goals, but they are also an appropriate tool in the healthcare setting for developing goals which are both effective and measurable (Revello & Fields, 2015). Creating SMART goals was an important part of being able to assess whether the change intervention was effective. Short-term SMART goals included: To learn how the wearable simulation devices operate and to introduce them to a small set of experienced nurses who then became "super-users" by week 2 post wearable device introduction. Intermediate-term SMART goals (3 months) included: Within 4 weeks of training super-users, to conduct a pilot study with the new graduate program using one of the wearable simulation devices (the chest piece) along with a standardized specialized procedure cart (the respiratory cart) and 2 case scenarios to help the new graduate nurse cohort practice identifying and responding to a rapidly deteriorating patient. Long-term SMART goals (6 months and beyond) included: Increase new nurse confidence and skill levels as reflected in the nurse-patient communication scores on Community Hospital's HCAHPS scores. Additional long term goals included: Decrease the overall number of errors made by nursing professionals (thereby decreasing cost) by using the wearable simulation devices for larger competency boot camp trainings (beyond the new graduate nursing programs), using the wearable simulation devices for

new grad training throughout Community Hospital, and ultimately gaining more funds via a grant for continued training purposes using the wearable simulation devices.

The Gantt Chart (see Appendix D) was another important tool used to monitor the progress of this change project. Rew et al. (2020) discuss the value of the Gantt chart for structuring nursing study and research, noting that this tool can be "used for planning projects of all sizes" and is useful for showing the time and sequence of work to be performed (para. 26). Additionally, Gantt charts allow viewers to see when various tasks related to the project are implemented relative to other aspects (Rew et al., 2020). In this way, the Gantt Chart helped structure and guide the entire project, helping to ensure that it stayed on track.

Finally, a Likert-scale type survey was developed by this author and chosen as an appropriate tool for measuring nurse confidence and perceived skill levels (see Appendix F). A Likert scale question asks respondents to read a statement and then choose a response from a list of numerically ordered responses (usually 5, 7, or 9 options). Each response is assigned a value such as *strongly agree*, *agree*, *neither agree nor disagree*, *disagree*, *strongly disagree*. The middle value is usually a neutral statement. Joshi et al. (2016) state that when Likert scale questions are written carefully and survey takers understand the statements being made, this method of evaluation is considered to have strong validity, as long as the person interpreting the responses interprets them correctly and in the appropriate context (e.g. not drawing conclusions that cannot be validly drawn from the actual statements and the respondents' responses). In this case, the survey questions ask respondents to evaluate their own knowledge and confidence levels when identifying and treating rapidly deteriorating patients.

The methods chosen were selected for use with a single pilot study in an 8 hour shift consisting of 6 new graduate hire nurses at Community Hospital with 3 educators, one master's

degree CNL student, and a veteran preceptor for each preceptee. Implementation of the specialized procedure cart and two more simulation rounds are anticipated for inclusion within the 12-week didactic program once the QI project implementation resumes.

Ethical Considerations

This project meets guidelines for the University of San Francisco's course guidelines for evidence-based implementation of a CNL change project (please see appendix E). This project was undertaken as an evidence-based change of practice project at Community Hospital and as such was not formally supervised by the Institutional Review Board. Education and continuing education, including simulation and skills days, have become part of the standard training and professional development programs in most hospitals.

Ethical principles of nursing which are foundational to this change project include the principles of nonmaleficence (doing no harm) and beneficence (doing good). For a nurse to do no harm means that s/he must remain competent in their field, learn best practices, continue to improve nursing practice as standards of care evolve, and remain a lifelong learner to provide optimal care. This change project is grounded in the principle of nonmaleficence insofar as it attempts to integrate best practices (simulation training) to educate novice nurses. Moreover, this change project is also designed to help novice nurses fulfill this ethical obligation by helping them develop the necessary confidence and skills for providing optimal patient care. Regarding the principle of beneficence, this change project is designed to increase novice nurses' skill levels in actively identifying and treating a deteriorating ICU patient; this fosters the ability of Community Hospital's novice nurses to actively 'do good' for their patients by providing timely

and effective treatment. In these ways, this change project is grounded in the ethical principles of nonmaleficence and beneficence.

One unanticipated ethical concern has arisen during the implementation of this project concerning use of hospital resources. The Covid-19 pandemic represents an enormous drain on hospital resources, particularly on staffing, due to the high volume of infected patients that require acute and complex care. On one hand, change projects promote the provision of high quality care and are therefore a vital part of serving the patient community. On the other hand, in the current climate of uncertainty over what the future of the hospital will look like during the pandemic, there is some concern over whether directing resources (both financial and personnel) toward change projects like this one represents an ethical use of hospital resources. It is challenging to determine what use of resources will do the most good for patients. Because only the initial pilot study for this project has been conducted so far, there is still insufficient evidence to demonstrate a significant positive impact from training with the wearable simulation device and the standardized special procedure carts; therefore, the question of whether Community Hospital should continue investing resources in this change project at the current time remains unanswered. While the project team strongly believes that continuing implementation of the change project could strengthen Community Hospital's new nurse training program and allow the facility to provide improved patient care and build nurse confidence, the project team also recognizes that the hospital has an ethical obligation to use its resources where they can do the *most* good, and that continuing with implementation of this change project at the current time may not meet that goal. Thus, further consideration and discussion is necessary.

Results

Because implementation of the change project has been put on hold due to the Covid-19 pandemic, this section will discuss both the *actual* results from the initial pilot study as well as the *expected* results which the project team anticipates after full project completion. The initial set of pre- and post-session nurse surveys indicated that the intervention had a positive impact on novice nurses' confidence and anxiety levels, reducing anxiety and increasing confidence (see Appendix G). Agreement levels with the statement "I feel confident with my assessment skills in identifying deteriorating patients" increased from 3.67 (pre-intervention) to 4.0 (post-intervention). Additionally, agreement levels with the statement "I feel confident when assessing breathing sounds on a patient" increased from 3.17 (pre-intervention) to 3.5 (post-intervention). These results—although they represent only preliminary findings from a very small cohort of 6 nurses—suggest that simulation training is an effective way to help novice nurses develop the skills and confidence they need to successfully practice nursing.

The project team expects to find similar results from future training sessions as well, with novice nurses indicating that the simulation training (which is designed to include training with the standardized procedure cart at some point during the 12-week training program) increases their ability to deliver effective, high quality care to their patients. Although further skills sessions/days cannot be scheduled until Community Hospital again allows change projects, the project team expects that future surveys will continue to indicate that the new nurse cohort perceives that the simulation training is beneficial in lowering their anxiety and increasing their confidence levels in treating rapidly deteriorating patients.

Discussion

Summary

The purpose of this change project was to introduce two practice innovations into the new graduate nurse training program at a community hospital in California: simulation training using wearable simulation devices and a standardized procedure cart. The aim was to help the novice nurse cohort develop their skills and confidence in identifying and treating rapidly deteriorating patients. The intervention was designed to be implemented in stages as a series of multiple skill-building sessions over the course of the 12-week new graduate training program, with the new graduate nurses gradually increasing their skills and confidence. However, due to the start of the Covid-19 pandemic in the Spring of 2020, only the first training session occurred. This session incorporated only one component of the wearable simulation suits (the chest piece) and did not involve the standardized procedure carts. The project team intends to continue with implementation once pandemic conditions allow; future training sessions will involve the other components of the wearable simulation suits (tracheostomy piece, central line, foley catheter insertion piece, and arm piece with PICC and PIC components) as well as the standardized respiratory procedure cart.

Key Findings

The initial findings indicate that the skills training sessions will likely have a positive impact on nurse confidence and skill in assessing and treating rapidly deteriorating patients. Although only one set of pre- and post-training surveys has been administered, these surveys as well as the verbal feedback offered during the scheduled training debrief time suggest that the novice nurses found the first session using the wearable chest piece simulator to be helpful. Data from the first round of pre- and post-training surveys showed an increase in the mean score on several key indicators, including nurses' confidence levels in assessing patient breathing sounds and identifying a deteriorating patient (see Appendix F).

The project team expects to find that regular simulation-based didactic training sessions improve novice nurses' confidence and skills in treating rapidly deteriorating patients.

Lessons Learned

The process of conducting the initial skills training session showed the project team additional gaps in the new graduate nurses' skill levels that would need to be addressed in future sessions. This required the project team to restructure the remaining plan so that it could incorporate training to address these areas including using additional tools (such as a standardized procedure cart) to help assist the new graduate nurses in simulation. During the pilot training session, it became clear that the new nurse cohort lacked knowledge about how to use a crash cart or procedure cart. This observation led to the idea of incorporating standardized procedure cart training into the intervention. In hindsight, it would have been helpful to anticipate that intensive training sessions would uncover additional opportunities for improvement and to be better prepared to integrate additional training.

Additionally, it became clear from the pre-intervention survey results that nurse confidence levels do not necessarily correspond with skill levels. For example, agreement levels with the statement "I am accountable for my actions and know the skills necessary for working as a licensed registered nurse" actually decreased (from 4.33 to 3.5) after the intervention. This suggests that helping equip nurses with additional skills may actually make them more aware of the limits of their own knowledge.

In regards to the implementation of the pilot study, it also became apparent that more training about conducting and responding during a simulation needed to be offered to help the educator, who wears the simulation suit and acts as the "patient," so he/she can learn to respond

appropriately. For example, one instance occurred when a nurse acting as the "patient" seemed distracted and also giggled when a student was assessing breath sounds.

Finally, there continues to be some irregularities with the wearable simulation technology that need to be addressed and evaluated in partnership with the vendor. For example, the project team discovered during the training session that the wearable simulation device is not "syncable" to just any device. Luckily, the project team was able to synchronize the wearable simulation chest piece to an appropriate phone so that it would produce the desired breath sounds; however, the team discovered that the suit does not produce equally clear breath sounds when paired with some other types of phones.

Success Factors

The insight and advice of the Nurse Educator were invaluable in designing and implementing this change project. There was an overall positive response from all stakeholders that using wearable devices in conjunction with the didactic training program was helpful in increasing novice nurses' abilities to identify a deteriorating patient and willingness to learn more skills and achieve confidence in real-life scenarios.

The scheduled debrief time during the pilot session was another success factor. This time allowed both the project team and the new nurse cohort to process their experiences and to identify additional areas of skill/knowledge that needed attention. For example, it was during this debrief session that the nurses and educators became aware that the student cohort had not been trained in how to use a procedure cart and that, even if they had been trained, Community Hospital's ICU procedure carts are not currently stocked with a standardized set up, so there is no way for a nurse to know exactly what is on the cart or where unless he/she happened to be the one who restocked it. This revelation confirms the importance of pilot testing and conducting

small tests of change when attempting to mitigate microsystem weaknesses. The Nurse Educator and staff developers agreed that implementing a standardized system of cart organization and training the nurses in how to use it will be valuable components of the intervention going forward. If the nurses can access the tools readily, then there is less time and stress related to looking for tools such as the respirator and intubation kit. The debriefing time facilitated this insight, allowing the author to reconfigure plans for further training scenarios to implement the "5Ss of Lean" — **s**ort, **s**et in order, **s**hine, **s**tandardize, and **s**ustain — (American Society for Quality, n.d.) as a framework for standardizing the procedure carts and integrating them into the simulation training sessions.

Limitations

The size of the new graduate cohort group at Community Hospital (6 nurses) means that the data gathered must be understood as presenting only limited generalizability to larger groups. More research on a larger scale is needed to identify clear trends in how simulation training impacts novice nurses' confidence and ability to assess and treat rapidly deteriorating patients. Additional data is also needed to gain insight into how new graduate nurses best learn in simulation scenarios and whether or not the additional tools such as the wearable simulation devices and standardized procedure carts will consistently produce positive outcomes and cost effectiveness.

Limitations also include the inability for this author to complete the change project due to the current Covid-19 pandemic. The pilot study offered promising initial results, but these results are inherently limited. Additional training sessions will need to be implemented before clear positive trends can be identified. Furthermore, the Covid-19 pandemic limited in-person

communication between this author and the preceptor/Nurse Educator, making it more difficult to discuss feedback, observations, and to develop future training sessions.

Sustainability

In order to sustain the simulation training as part of the new graduate nurse training program, the initial set of pilot sessions will need to consistently produce positive results. This will allow the project team to make a convincing case to Community Hospital for justifying continuation of support of wearable simulation training.

Continuing to train the educators in how to use the wearable simulation suits will also be an important factor in sustaining the program. If the educators are well trained, then they will be able to offer the new nurse cohort high quality, effective simulation scenarios so that the novice nurses can increase their confidence and develop their skills.

Practice Implications

While the one-time upfront cost of purchasing the wearable simulation devices represents a significant cost ($25,000 - $35,000) to the hospital, integrating simulation training into the established new graduate nurse training program at Community Hospital could have significant benefits for patient care. By helping novice nurses to develop their skills and confidence, the simulation training can facilitate more timely and accurate assessment and treatment for their patients. This could also increase the efficiency of the unit, since the more confident and competent novice nurses would not need to call for help from veteran nurses as frequently.

If the wearable simulation change project in the Community Hospital ICU produces the anticipated positive results, then this could have implications for practice throughout other units in Community Hospital. The simulation training program could be expanded to other units as an intervention to help train their novice nurses and include other veteran nurses. Perhaps the

wearable simulation suits could eventually be used for hospital-wide skills training sessions. Innovative approaches and effective working relationships with vendor partners have the potential to improve staff education, patient safety, and quality outcomes.

Conclusions

Simulation training is an innovative training method that provides a realistic yet safe learning environment for nurses to develop and practice specific skills. Integrating simulation training into novice nurse training programs can help transition these new nurses and support development of the skills and confidence they need to deliver high quality patient care. At Community Hospital in northern California, a change project was implemented in the ICU which involved using wearable simulation suits as a test of change to help new graduate nurses learn to recognize, assess, and treat rapidly deteriorating patients during their 12-week orientation process. Project implementation was interrupted by the Covid-19 pandemic, so only the first pilot training session using just one of several components of the wearable simulation suits was conducted. Future implementation plans include incorporating the other components of the simulation suits into pre-structured training sessions as well as integrating training in how to identify and use a standardized procedure cart. Initial results suggest that the simulation training had a positive impact on novice nurses' ability to recognize and treat rapidly deteriorating patients as well as the ability to more accurately assess their own nursing skill levels and recognize additional learning needs. In conclusion, the introduction and implementation of nursing practice innovations in the ICU support new graduate nurse orientation programs, equipment standardization, and the timely adoption of technology to enhance both patient and organizational outcomes.

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Appendix A

Annotated Bibliography

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This systematic literature review of 7 peer-reviewed quantitative and qualitative studies examined primary research studies in which the interventions involved simulation (including the use of physiologically accurate mannequins). The review identifies those elements of simulation training which prehospital emergency nurses and paramedics perceive as most important for their learning. Results indicated that areas of priority for simulation training include realistic scenarios, scenarios that are complex and repeatable (since repetition increases the provider's experience), ability to interact with the patient, and debriefing following training exercises. Results also suggest that simulation-based training supersedes cadaver-training and didactic training as a method for teaching practical skills. The authors conclude that simulation-based learning can help mitigate the need for years of clinical/field experience in helping care providers develop their skills and abilities.

The review findings suggest the importance of simulation-based training as a way of helping care providers gain rapid experience without spending years in a clinical setting. Interestingly, the fact that repeatable simulations are of primary importance in increasing learning suggests that, in this area at least, simulation-based training may actually develop skills and knowledge more rapidly than clinical experience. High inter-rater agreement and rigorous review methods characterized this review.

Johns Hopkins Nursing Evidence-Based Rating: LIII, A

Boling, B., & Hardin-Pierce, M. (2016). The effect of high-fidelity simulation on knowledge and confidence in critical care training: An integrative review *Nurse Education in Practice, 16*, 287-293. Doi:10.1016/j.nepr.2015.10.004

This systematic review examined 17 original, peer-reviewed, research studies (including both quantitative and qualitative studies) that researched the effects of high-fidelity simulation training using mannequins, examining the impact of such training on critical care nurses' knowledge and confidence. One particularly important feature of simulation training includes its ability to provide repetition. The authors note that traditional education/training methodologies (e.g. lectures, reading assignments, self-paced teaching modules) appear to be inferior to simulation as a method for preparing clinical practitioners and helping them apply knowledge to practice. Of the studies reviewed, all 17 found that high-fidelity simulation contributed to improved provider knowledge; of the 13 studies which examined confidence levels, all 13 found that high-fidelity simulation also increased confidence.

Many of the studies reviewed had small sample sizes and/or did not utilize a control group; however, the authors were extremely clear in discussing both the strengths and limitations of each study reviewed. One of the most interesting findings to support the use of simulation-based training is that several of the studies reviewed indicate that simulation-based training—rather than clinical experience—may actually have a greater positive impact on clinical knowledge and may be a better provider training tool.

Johns Hopkins Nursing Evidence-Based Rating: LIII, B

Everett- Thomas, R., Valdes, B., Valdes, G. R., Shekhter, I., Fitzpatrick, M., Rosen, L. F., Arheart, K.L, & Birnbach, D. J. (2015). Using simulation technology to identify gaps between education and practice among new graduate nurses. *Journal of Continuing Education in Nursing, 46*(1), 34-40. https://doi.org/10.3928/00220124-20141122-01

This is a retrospective analysis of data from an institution that had 98 new graduate nurses who participated in a nurse residency program who were then assigned to 20 different groups. All of the participants successfully passed their National Council Licensure for Registered Nurses (NCLEX-RN) and were new hires at the hospital. The trainers and staff members used Madeleine Leininger's theory of transcultural care as a guideline to provide quality care to patients. The trainees participated in a 10-week didactic educational program which included simulation training with 5 chronic diseases: acute myocardial infarct, hyperglycemic crisis, hypoglycemic crisis, sudden cardiac arrest, and heart failure (HF) with respiratory distress. The simulation scenarios included using an adult mannequin patient simulator (a.k.a. SimMan) used throughout the training. Four categories were scored based on the new graduate nursing group to: demonstrate common patient safety procedures, recognition of the patient's condition and/or disease, perform technical skills, and determine a proper plan of care accordingly. A clinical scenario checklist was used to evaluate performances on a scale of 0 to 2 (whereas 0= no task attempt was made, 1= task was incompletely performed, and 2= task was completely performed. Analytical data was drawn from using SAS software (version 9.3) to determine statistical significance to the .05 level over a 5 week period. Results showed that 2 out of 5 groups demonstrated subpar critical thinking skills for prioritization and task completion

during the first weeks, and significant improvement in overall performances as the weeks progressed.

Johns Hopkins Nursing Evidence-Based Rating: Level III, B.

Marzouk, T. (2015). Effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students. *Journal of Nursing Education and Practice, 5*(8), 51-59. Doi:10.5430/jnep.v5n8p51

This randomized controlled trial consisted of 92 nursing students who were randomly assigned to one of two groups: those who received only the traditional clinical training and those who received an additional simulation-based training before their clinical training. The simulation-training used both high-fidelity and medium-fidelity full-body mannequins. A 20-item observational checklist was used to evaluate students' achievement and a 5-item questionnaire was used to evaluate the students' satisfaction levels with their clinical experience. Results indicated statistically significant differences ($p < .001$ in both categories) between the two groups' mean scores in both practical achievement (46.5 for the simulation-based intervention group vs. 36.9 for the control group) and student satisfaction (21.1 for the intervention group vs. 11.2 for the control group). The authors conclude that simulation-based training enhances students' practical achievement and confidence.

This study contributes clear data to support the use of simulation-based training as a way to increase nurse confidence and skill levels. A rigorous study design, clear conclusions, and consistent results characterize this study.

Johns Hopkins Nursing Evidence-Based Rating: LI, A.

Terzioğlu, F., Yücel, C., Koç, G., Şimşek, S., Yaşar, B.N., Şahan, F.U., Akın R., … Sevda Yıldırım, S. (2016). A new strategy in nursing education: From hybrid simulation to clinical practice. *Nurse Education Today, 39*, 104-108. Doi:10.1016/j.nedt.2016.01.009

This prospective study of 59 nursing students was designed to evaluate the effectiveness of 3 different instructional environments (the nursing skills laboratory, standardized patient laboratory, and clinical practice environment) as they impacted nursing students' levels of anxiety and satisfaction as well as their communication and psychomotor skills. Results indicated that participants' psychomotor skills and confidence levels were higher in the simulated (standardized patient) and clinical practice environments than they were after completing training in the nursing skills laboratory. The authors conclude that complex instructional environments that more closely imitate reality are more effective for training nurses than low-fidelity educational environments such as nursing skills laboratories.

The study's findings support the use of simulation-based training as an effective component of nurse training and/or education. The study utilized pre- and post- intervention questionnaires as well as skills checklists to assess participants' skill and confidence levels both before and after their education in the 3 different instructional environments, which yielded statistically significant, quantifiable results about the positive impact of high-fidelity training (such as simulation-based training) on nurse skills and confidence.

Johns Hopkins Nursing Evidence-Based Rating: LII, A

Uslu, Y., Kocatepe, V., Unver, V., Sagir, O., & Karabacak, U. (2019). Hybrid simulation in triage training. *International Journal of Caring Sciences, 12*(3), 1626-1637. https://www.internationaljournalofcaringsciences.org/docs/33_uslu_original_12_3.pdf

This descriptive study of 54 senior nursing students was designed to evaluate the use of hybrid simulation in triage training. Students were presented with different triage scenarios using a combination of high-fidelity mannequins and standardized patients (trained actors) and expected to classify them according to triage level (red=very urgent, yellow=urgent, green=non-urgent). Students were video-taped and their performance evaluated according to a standardized checklist that assessed six categories: situational awareness, leadership, clinical decision making, communication and team working, patient and employee safety, and skill implementation. Additionally, student feedback was obtained to evaluate their perceptions of the effectiveness of the training. Results showed that students scored highest in the "yellow" triage category and lowest in the "red" category. Student feedback was positive, with 65.5% indicating that the simulation helped them better understand the subject, 55% indicating that the simulation scenarios provided effective review of previously learned material, 75% indicating that the simulation scenarios made it easier to transfer knowledge to the clinical environment, and 100% of students indicating that the simulation based training facilitated their education.

Although the scenarios were limited (only four common case scenarios were used) and the study cohort was fairly small (n=54), the study was well constructed and the authors explained methods, results, conclusions, and limitations clearly. Overall, this study offers clear, quantifiable results about the use of simulation, including mannequin simulation, in training

nursing students. Importantly, it provides data about both the students actual skill level and their perceptions regarding simulation-based training.

Johns Hopkins Nursing Evidence-Based Rating: Level III, B.

Appendix B

Community Hospital Inpatient Profile

Inpatient Unit Profile-Intensive Care Unit

A. Purpose:
Why does your unit exist? To provide intensive care for critically ill patients.

	Site Contact:	Date: 10/30& 10/31
Administrative Director:	Nurse Director:	Medical Director:

Know Your Patients: Take a close look into your unit, create a "high-level" picture of the PATIENT POPULATION that you serve. Who are they? What resources do they use? How do the patients view the care they receive?

Est. Age Distribution of Pts:	**%**	**List Your Top 10 Diagnoses/Conditions**		**Patient Satisfaction Scores**		**% Always**
19-50 years	15	1. Septic Shock	6.Pneumonia	Nurses		88
51-65 years	50	2. Resp. Failure	7. DKA	Doctors		100
66-75 years	34	3. S/P Cardiac Arrest	8. Acute Renal Failure	Environment		100
76+ years	1	4.Stroke	9. Infectious and parasitic diseases	Pain		75
		5.Heart Alert	10. Uncontrolled DM II	Discharge	84% Yes	
% Females	60			Overall	Hospital Grade C Based off hospitalsafetygrade.or/h/o connor-hospital% **Average**	

Living Situation	**%**	**Point of Entry**	**%**	**Pt Population Census: Do these numbers change by season? (Y/N)**	**Y/N**
Married	40	Admissions	5	Pt Census by Hour	N
Domestic Partner	5	Clinic	0	Pt Census by Day	Y
Live Alone	7	ED	90	Pt Census by Week	Y
Live with Others	8	Transfer	5	Pt Census by Year	Y
Skilled Nursing Facility	12	**Discharge Disposition**	**%**	30 Day Readmit Rate	(ND)
Nursing Home	15	Home	2	Our patients in Other Units	NA
Homeless	8	Home with Visiting Nurse	5	Off Service Patients on Our Unit	(ND)

Patient Type	**LOS avg.**	**Range**	Skilled Nursing Facility	**5**	Frequency of Inability to Admit Pt	(ND)
Medical	7		Other Hospital	5		
Trauma/Neuro/ Cardiac	4.2		Rehab Facility	8	***Complete "Through the Eyes of Your Patient", pg 8**	
Mortality Rate	Data Not available		Transfer to ICU: Transfer Out of ICU to Tele or Med-Surg and TCU	75		

Know Your Professionals: Use the following template to create a comprehensive picture of your unit. Who does what and when? Is the right person doing the right activity? Are roles being optimized? Are all roles who contribute to the patient experience listed?

Current Staff	**Day FTEs**	**Evening FTEs**	**Night FTEs**	**Weekend FTEs**	**Over-Time by Role**	**Admitting Medical Service**	**%**
Intensivist Total	3-12hrs					Internal Medicine	
Residents Total	2-12hrs					Hematology/Oncology	
Unit Leader Total	1-8hrs	1-8hrs	2-8hrs	2-8hrs	ANMs	Pulmonary	
CNSs Total	0					Family Practice	
RNs Total	10-8hrs 2-12hrs	8-8hrs 2-12hrs	10- 8hrs NOC 2-12hrs			ICU	
LPNs Total	NA					Other	
LNAs Total	NA					**Supporting Diagnostic Departments**	
Technicians/Secretaries "muck" Total	**1 "muc" for census for unit**	**1 "muc" for census for unit**	**1 "muck" for census full amount for unit**			(Respiratory, Lab, Cardiology,	
						Pulmonary, Radiology and Physical Therapy)	
Clinical Resource Coord.	No Clinical Coordinator	No Clinical Coordinator	No Clinical Coordinator	No Clinical Coordinator			
Social Worker	1 (0800-1700)						
Health Service Assts.	No serivce assistants						
Ancillary Staff							
Do you use Per Diems?	__X__Yes	_____N	**Staff Satisfaction Scores**				%

		O			
Do you use Travelers?	__X__Yes	_____N O	How stressful is the unit? Very	% Not Satisfied	10
Do you use On-Call Staff?	_____Yes	____X_N O	Would you recommend it as a good place to work? Unsure	% Strongly Agree	
Do you use a Float Pool?	_____Yes	___X_ NO			

***Each staff member should complete the Personal Skills Assessment and "The Activity Survey", pgs 10 - 12**

Know Your Processes: How do things get done in the microsystem? Who does what? What are the step-by-step processes? How long does the care process take? Where are the delays? What are the "between" microsystems hand-offs?

1. Create flow charts of routine processes.	**Do you use/initiate any of the following?**	**Capacity**	# Rooms: 24	# Beds: 24
a. Overall admission and treatment process	Check all that apply			
b. Admit to Inpatient Unit	□ Standing Orders/Critical Pathways	**# Turnovers/Bed/Year _____**		
c) Usual Inpatient care	x Rapid Response Team			
d) Change of shift process	x Bed Management Rounds	**Linking Microsystems**		
e) Discharge process	x Multidisciplinary/with Family Rounds	(ICU)		
f) Transfer to another facility process	□ Midnight Rounds			
g) Medication Administration	□ Preceptor/Charge Role			
h) Adverse event	□ Discharge Goals			

2. Complete the Core and Supporting Process Assessment Tool, pg 14

Know Your Patterns: What patterns are present but not acknowledged in your microsystem? What is the leadership and social pattern? How often does the microsystem meet to discuss patient care? Are patients and families involved? What are your results and outcomes?

• Does every member of the unit meet regularly as a team? NO.	– Do the members of the unit regularly review and discuss safety and reliability issues? Daily 15 mins huddle and when Joint Commision comes.	□ What have you successfully changed?
		↑↑ What are you most proud of? Teamwork on Day Shift
_ How frequently? Monthly for 2.5 hours		□ What is your financial picture?
What is the most significant pattern of variation?		***Complete "Metrics that Matter", pgs 20 & 21**

Appendix C

TeamSTEPPS framework and Teaching Plan

TeamSTEPPS Framework

(AHRQ, 2013, p. 4)

Teaching Plan

I. Gathering new graduates together: Convene new graduates to introduce QI project, discuss student expectations, and create a culture of learning and continuous improvement in the work environment.

II. Training Session (1.5 hours)

A. Pre-simulation survey: hand out survey (5 minutes)
B. Room set-up with wearable device on "actor", set up scenario/run-through, bring the specialized procedure cart and kiosk in the room vicinity, while new grad hires remain in conference room (10 minutes)
C. Designate primary nurse and resource nurses (5min)
D. Off-going educator nurse gives report and starts off the first scenario (20 minutes)
E. New grads then switch roles and use a new scenario for another practice. (20 minutes)
F. De-brief: learners share their experiences and challenges, offering feedback and discussing how the tool might change their ICU attitudes and skillset on recognition of a deteriorating patient. (45 minutes)

G. Post-simulation survey is handed out with another QR code. (5 minutes)

lll. Follow-up sessions 3 weeks post pilot study

A. 3-week post simulation will focus on answering any questions and concerns the students may have. At this point, feedback from each of the students' individual preceptors are solicited via email to see what needs to be worked on. The student is called in to discuss the evaluation from the preceptor and improvements needed. (30 min. total)
B. 6-week post simulation will incorporate another set of 2 case simulation scenarios with specialized procedure carts with kiosks available. The follow-up will focus on weak points that the majority of the group may exhibit. From here, the educators will implement yet another round of wearable simulation device training scenarios using the specialized procedure carts as an additional tool for the new nurse.

Appendix D

Gantt Chart of Action Plan

Phase 1: Unfreezing	**Jan. 2020**	**Jan. 2020**	**Feb. 2020**	**Mar. 2020**	**Mar. - Apr. 2020**	**Apr. 2020**	**June - July 2020**	**Aug. 2020**	**PostAug. 2020**
Literature Review									
Creation of Proposal and Learning Needs Assessment									
Presentation of Proposal to CNE									
Introductory Staff Meetings									
Phase 2: Change									
Development of a Training Module with structured content and learning activities									
Nurse Manager and Assistant Nurse Managers Complete Training Module									
Frontline Staff is Trained									
Phase 3: Refreezing									
Continued Use of New Wearable Sims Training Process; Auditing by Director of Education Services									
Phase 4: Ongoing training									
Development of additional training sessions, including use of a standardized procedure cart and other wearable simulation devices									

Appendix E

Evidence-Based Change of Practice Project Checklist

Instructions: Answer YES or NO to each of the following statements:

Project Title: **Implementing Simulation in ICU New Graduate Nursing Orientation:** **Introducing Two Practice Innovations**	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	**x**	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	**x**	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	**x**	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	**x**	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	**x**	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	**x**	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	**x**	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	**x**	

If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	**x**	

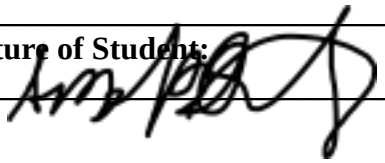
ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print): Aiza Quinday

_____

Signature of Student:



_____DATE____3/23/2020_____

SUPERVISING FACULTY MEMBER (CHAIR) NAME (Please print):

_____

Signature of Supervising Faculty Member (Chair): _____

Catherine Coleman

_____DATE_____

Appendix F

Pre- and Post-Training Survey Questions

1. I feel confident with my assessment skills in identifying deteriorating patients.

1	2	3	4	5
Strongly disagree	disagree	Neither agree nor disagree	agree	Strongly agree

2. I feel anxious when speaking to my patients in regards to their care.

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

3. I feel confident with assessing breath sounds on a patient.

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

4. I know what tools to look for in a procedure cart if warranted in an emergency situation.

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

5. I can implement the next steps of intervening of a deteriorating patient.

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

6. I am accountable for my actions and required to know the skills necessary for working as a licensed registered nurse

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

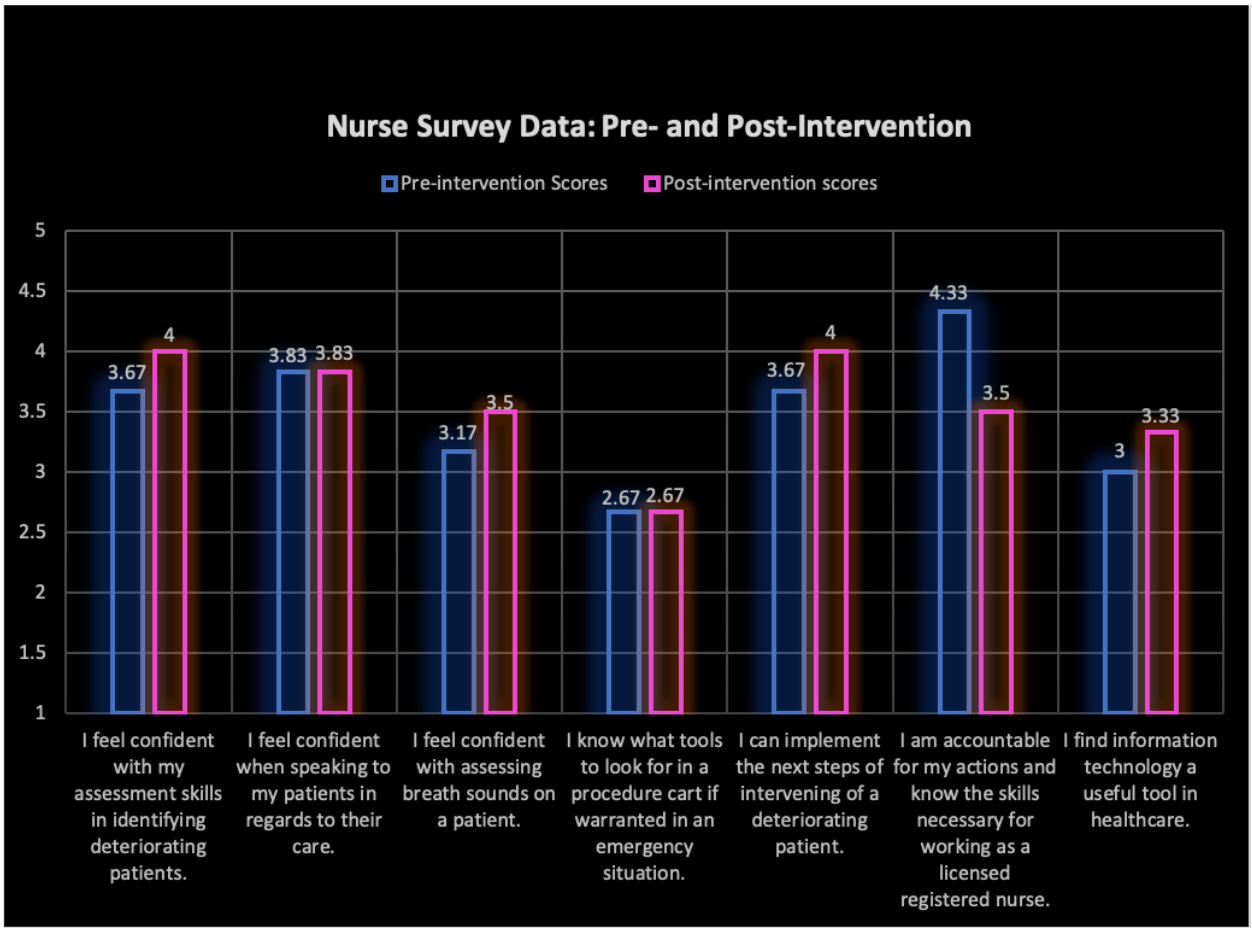
7. I find information technology a useful tool in healthcare.

1	2	3	4	5
strongly disagree	disagree	Neither agree nor disagree	agree	strongly agree

8. Please list any comments or questions below:

Appendix G

Nurse Survey Data: Pre- and Post-Intervention Results



(1= strongly disagree; 5 = strongly agree)

Raw data

Survey Statement 1= strongly disagree; 5 = strongly agree	Pre-intervention scores	Pre-intervention (mean score)	Post-intervention scores	Post-intervention (mean score)
I feel confident with my assessment skills in identifying deteriorating patients.	3,3,3,4,4,5	3.67	3,4,4,4,4,5	4.0
I feel confident when speaking to my patients in regards to their care.	4,4,4,4,4,3	3.83	4,4,4,4,4,3	3.83
I feel confident with assessing breath sounds on a patient.	2,3,3,3,4,4	3.17	3,3,3,4,4,4	3.50
I know what tools to look for in a procedure cart if warranted in an emergency situation.	2,2,3,3,3,3	2.67	2,2,3,3,3,3	2.67
I can implement the next steps of intervening of a deteriorating patient.	3,3,3,4,4,5	3.67	3,4,4,4,4,5	4.0
I am accountable for my actions and know the skills necessary for working as a licensed registered nurse.	4,4,4,4,5,5	4.33	3,3,3,4,4,4	3.5
I find information technology a useful tool in healthcare.	3,3,3,3,3,3	3	3,3,3,3,4,4	3.33

Appendix H

Cost Benefit Analysis Table

	One-time cost of simulation devices*	**Annual number of new graduate nurse hires** (average)	**Total annual turnover cost** (# of new hires × $30,000**)	**Year 1** (annual turnover cost + simulation suit cost)	**Year 2**	**Total 2 year cost** (Year 1 + Year 2)
100% annual	$35,000	6	$180,000	$215,000	$180,000	$395,000

turnover (of new graduate nurses)						
75% annual turnover rate	$35,000	4.5	$135,000	$170,000	$135,000	$305,000
50% annual turnover rate	$35,000	3	$90,000	$125,000	$90,000	$215,000
25% annual turnover rate	$35,000	1.5	$45,000	$80,000	$45,000	$125,000

* Each of the 5 simulation suit devices costs $5,000 - 7,000, so the entire cost is $25,000 - 35,000. Because this is a one-time cost, it is included in the Year 1 cost, but not Year 2.

** $30,000 is the approximate cost of training/orienting a new grad hire according to Community Hospital's Nurse Educator